

# Advancing Sustainable Surface Engineering: Challenges & Future Opportunities

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# Who We Are

- We are an independent, non-profit, science, technology, and strategy company
- We work in the public interest
- We provide our clients with conflict-free solutions
- We have no commercial interests in vendors or products



# Why Do We Care?

- Real Environmental Health & Safety Risks Yet ....
  - Not The Driver in DoD
- Primary Drivers - Performance and Cost
  - Reduced Sustainment Costs
    - ESOH compliance
    - Energy costs
    - Inefficient processes
    - Supply chain risk
  - Reduced Liability
    - Environmental and occupational
  - Increased Availability/Readiness
    - Improved throughput
    - Easier field maintenance
  - Improved Performance

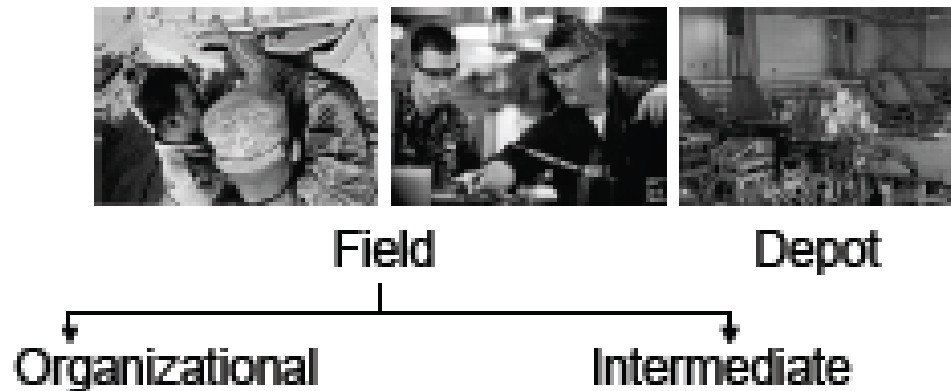
# Systems Supported By DoD

- 40,600 Combat Vehicles
- 896 Strategic Missiles
- 256 Ships
- 14,800 Aircraft
- 346,000 Tactical Vehicles
- Equipment
  - Communications
  - Electronics
  - Support



Maintenance Costs \$79.3B (FY13)

# Levels of Maintenance



## Intermediate Field Level

### Army

- 49 Aviation
- 269 Ground

### Navy

- 12 Shore fleet readiness
- 25 Aircraft
- 8 Maintenance facilities

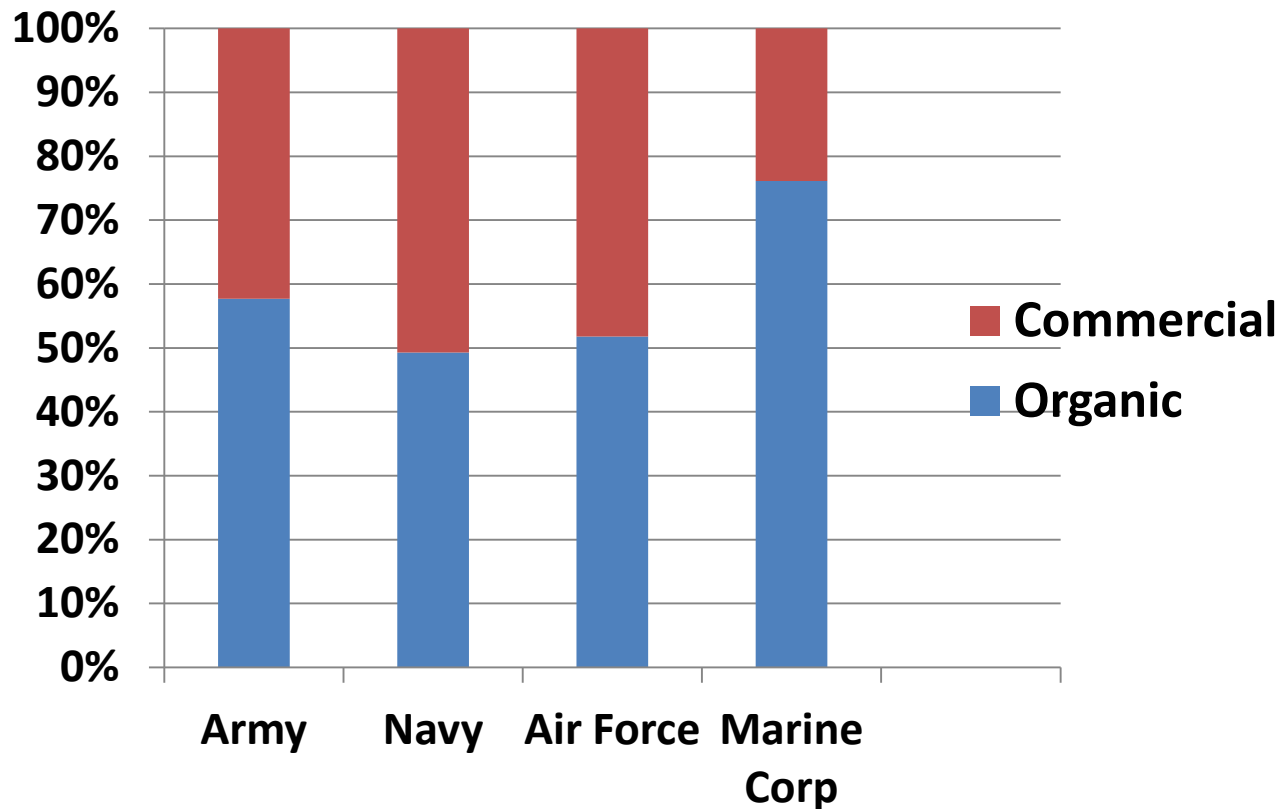
### Air Force

- 56 Aircraft & missile



# Organic and Commercial

**DoD's Depot Level Workload  
- 53% Organic & 47% Commercial -**



# Where Have We Been?

***(Lessons Learned or Party Like its 1999)***

- Depots vs OEMs
  - JG-APP & JDEP
- One Solution Not Possible
- HCAT Lessons
- Limitations of Empirical Approaches
- The Valley of Death
  - *Or is it valleys?*



# Barriers To Replacements (2006)

- There is no cohesive Pentagon policy requiring alternatives
- The management system tends to provide little reward for success, but exacts a high penalty for failure
- Its necessary to obtain accurate and extensive performance and cost data for different applications
- Change is hindered by difficulty in credibly predicting the cost of new technologies
- Cost analysis does not adequately look at long term risks, continued availability of hazardous technologies, and sustainment costs

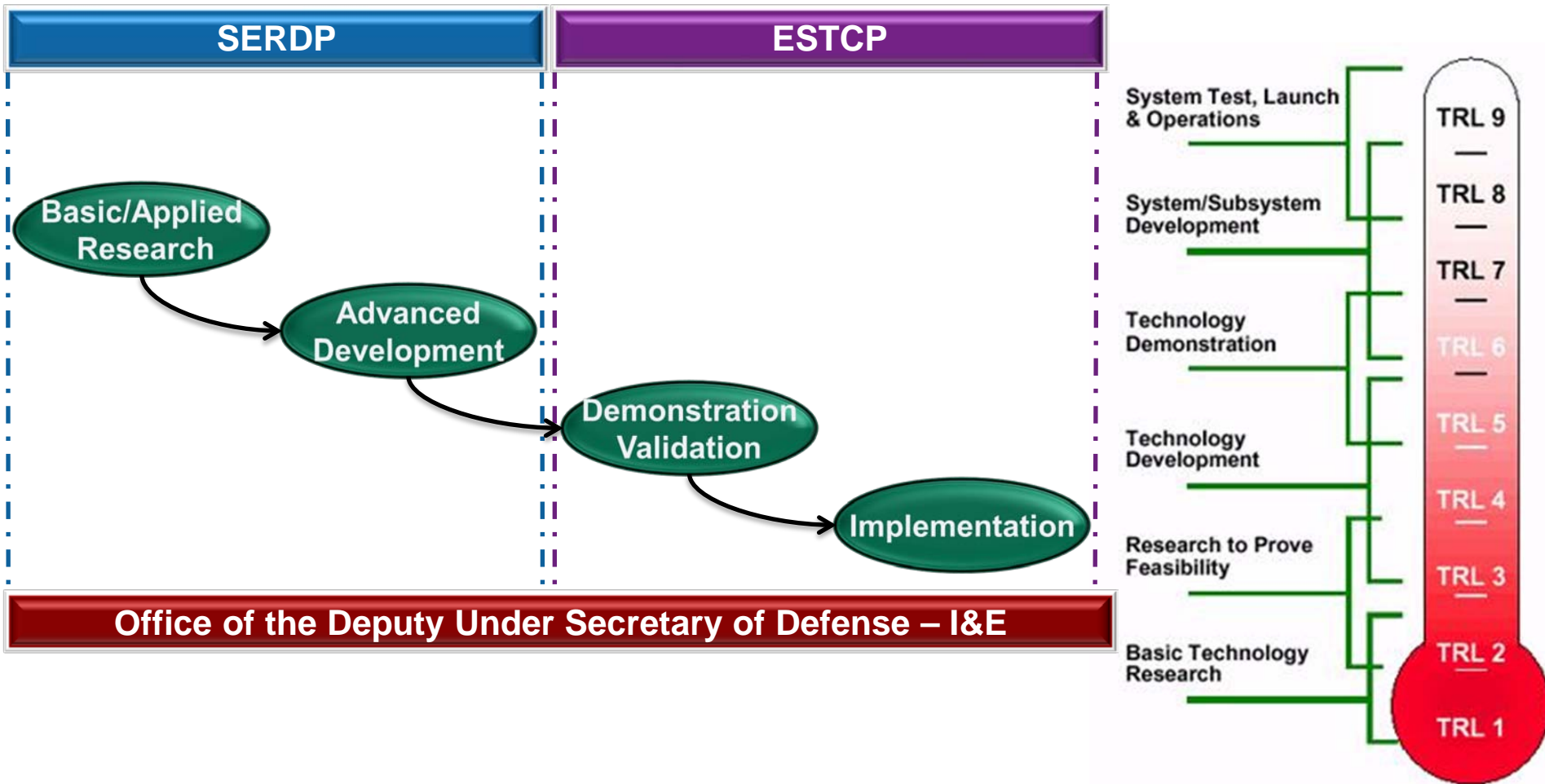
# Priorities (2006)

- 11 Cross Cutting Requirements
  - Acceptable cost-benefit methods and data
  - Technical database of surface finishing technologies
  - Acceptable valid test methods
  - ...
- 33 Specific Needs (engines, fasteners, structural, electronics, actuators)
  - Qualify chromate alternatives
  - Understand how non-Cr+6 inhibitors work
  - Elimination Be
  - ...

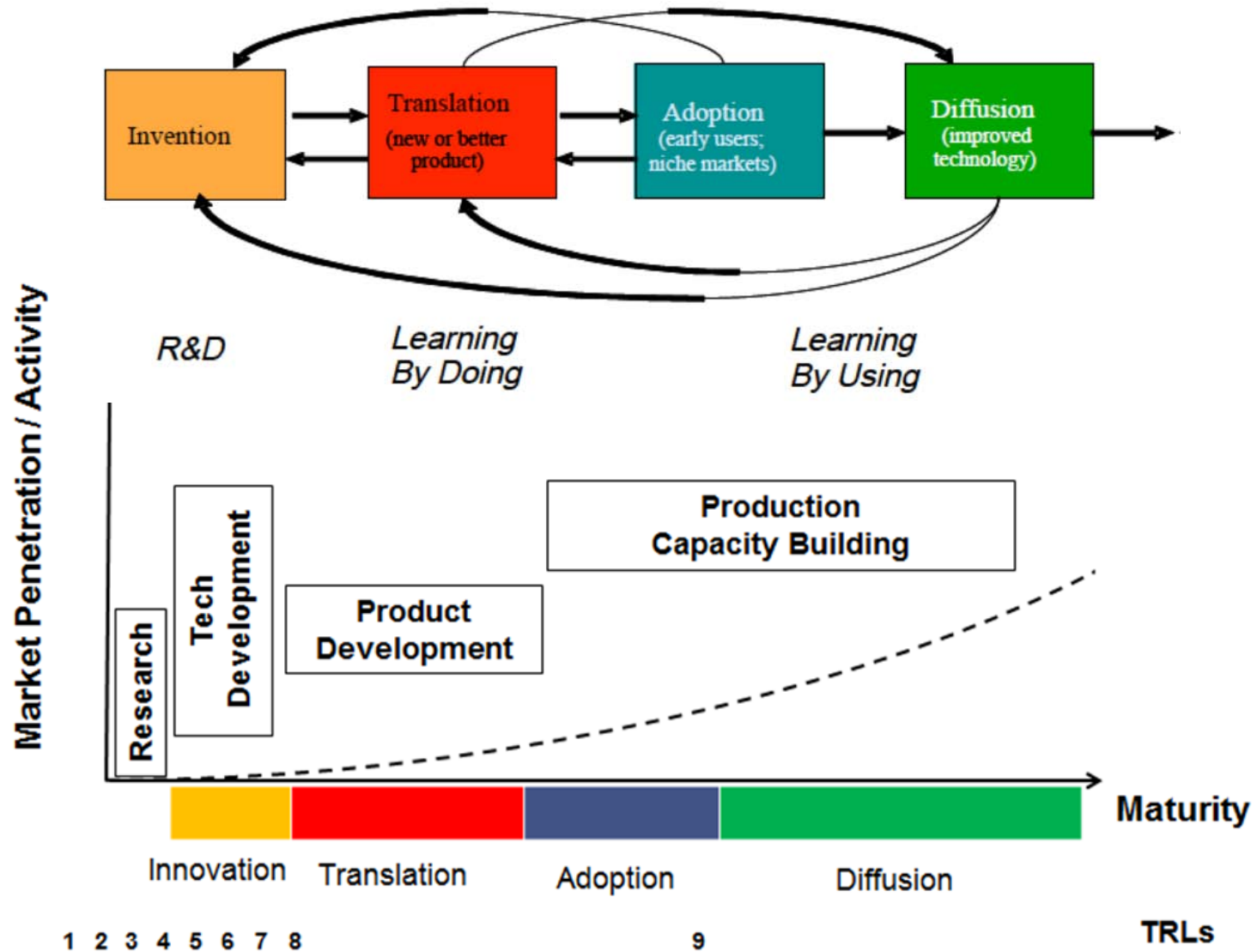
# Where Do We Need To Go?

- Alternatives For All Applications
  - Today's substrates and tomorrow's
  - For all systems
  - For all components
  - Applicable at all levels of maintenance
  
- With Trusted Cost & Performance Data
  - Qualification
  - Authorization
  - Implementation

# “Technology Development Process”



# Late Stage Technology Maturity



# Opportunities/Challenges

- Focus on Broadest Implementation
  - The Biggest ROI
    - Elimination across the entire shop floor increases cost effectiveness
  - Expand beyond organic depots
    - Significant work load in commercial maintenance facilities
    - Field level performance & savings are critical
- The Past Is Prologue
  - Partnerships are still critical
  - Empiricism is insufficient
- Computational & Advanced Testing Methodologies
  - Based on mechanistic understanding
  - Accelerate transitions
  - Predict life cycle results
  - Optimization of processes for all applications

# Closing Thoughts

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- We Have Made Great Progress
- Challenges Still Exist
- The Need and Value Will Only Increase

**“Technological superiority is not assured, R&D is not a variable cost, and time is not recoverable.” – Katrina McFarland ASD(A)**